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standpoint which they represent is more generally understood now than when they were written. There are in these earliest writings the same elements of permanent interest, — sound scholarship, breadth of view, clearness of thought and expression, — which mark Professor Pringle-Pattison's more recent publications. As both the volumes in which these essays originally appeared have been for some time out of print, their republication in the present work will fortunately serve to make them known to a new generation of readers. J. E. C.

The Aims and Achievements of Scientific Method: An Epistemological Essay. By T. PERCY NUNN. London, Macmillan & Co., 1907. — pp. x, 144.

This little book is an expansion of a paper bearing the same title which was read before the Aristotelian Society of London in 1906, and published in their proceedings for the same year (Vol. VI, N. S.). In its present form, it was presented to the University of London as a thesis for the degree of Doctor of Science.

As a clear and compendious statement of some of the main positions of the 'New Realism,' Dr. Nunn's book may be heartily recommended. He himself acknowledges that he owes the essential features of his doctrine to the work of Mr. G. E. Moore and Mr. Bertrand Russell. "The essence of the doctrine is the view that a large part of the contents of our consciousness from moment to moment consists of elements which exhibit themselves as having a certain unique 'priority' to our conscious processes. These elements constitute what I have described as the objective. The aim of the scientific process as it occurs in the individual is to render the objective in its actual determinations intelligible" (p. 142). Along with this realistic doctrine, and as contributing to its elucidation and support, Dr. Nunn discusses the development of some of the fundamental conceptions and hypotheses of physical science, analyzing the functions which they fulfil in making the objective intelligible. Perhaps the most striking result of the discussion is the conclusion, which is maintained against both Mach and the Pragmatists, that there is a complete break between judgments which deal with primary facts alone and 'scientific' judgments which are all secondary constructions of facts.

Dr. Nunn's essay is a sound and careful piece of work. Although its brief compass made impossible any detailed discussion of the problems involved, the outline presented in the different sections is clear and precise in statement. J. E. C.

The World Machine. The First Phase: The Cosmic Mechanism. By CARL SNYDER. London, New York, Bombay, and Calcutta, Longmans, Green, & Co., 1907. — pp. xvi, 488.

This is the first of three proposed volumes on the same general theme, the sub-titles of the other two to be, *The Mechanism of Life*, and *The Social*

Mechanism. It is an ingenious and scholarly historical work written in a popular, enthusiastic style which sometimes glows with admiration for the heroes of the history of science and their work. Perhaps most American scholars would find the book better suited to their taste, if the style were less loose and evangelistic. Certainly the present writer would. There can, however, be no question of the author's mastery of the subject, or of the permanent value of this reconstruction of the history of the deeper ideas in our scientific view of the physical world. The writer's intense human interest in and admiration for the personalities of the leaders of scientific thought in all ages, his familiarity with the details of their lives and work, and especially his brilliant sense of historical perspective and continuity, are splendid. The account is often dramatic. It not only reproduces well-known facts of history, but where these are scanty or lacking, as in the case of the ancients, he tries to reconstruct the concrete experiences which must have led up to discovery. There is, however, no confusion of fact and fancy.

It may be well to cite one example. Speaking of Bion, he writes. "Of this Bion, the mathematician, and native, like Democritus, of Abdera, we have only a line. 'He was the first person who asserted that there were countries where there was day for six months and night for six months.' That was all that remained to him of fame, when in the second century of our era Diogenes of Laerté came to write that curious history to which the larger part of our knowledge of the ancient philosophers is due. But consider for a moment all that this assertion of Bion's implies." Then follow nearly four and a half pages of reconstruction based on simple principles of geometry and the law that light moves in straight lines (such knowledge as the ancients possessed), to show that Bion, without having travelled beyond the boundaries of the civilized world, may with certainty have arrived at his deduction.

In the first chapter, the aim of the book is stated as follows : "I wish to trace out the path and the method by which these ideas [of the world-machine], these results, have been reached." The writer professes a thoroughly naturalistic and positivistic view of the world. "In the experimental investigation of the scheme of nature, the mind of man has a work to do ; but with the outer mystery it has nothing to do. We may conceive that in the time to come it will wholly give over the search for final causes or first causes, will recognize its vanity and absurdity. What we call philosophy will be transformed or forgotten." He seems to disclaim any belief in religion. "A religion of nature is a chimera, an antithesis of terms. The aims of nature seem as various as its phenomena, and in the future the hallucinated mind which professes to surprise its secret will be regarded as the proper subject of the alienist." We can never explain, we can only describe. "No untoward visit of some vagrant sun to our system interrupting, we shall in time complete the description of cosmos and its contents ; but the 'why' of things will remain as obscure as now." Democritus and Archimedes are characterized as "the greatest intellects of antiquity," and Eratosthenes is rated as much superior to Aristotle, who "did not have the exact and measuring sort of mind." Plato's name is scarcely mentioned except as an example, along with Socrates, Hegel, and others, of all that is futile and fatuous in the way of thought. It never seems to occur to the author that his positivistic naturalism is itself a philosophy, or that it may be shot through and through with contradictions. This is a minor feature of the present book, but it must become more prominent in the two books which are to succeed it in the series; it is accompanied by a certain wordiness and bumptious grandiloquence of style which are likely to offend many thoughtful readers. Were it not for "what we call philosophy," there would probably be no science; and there can never come a time when the *imago mundi* can be completed without its aid. On the whole, we should say the world can do without science much more easily than it can do without philosophy, but we may differ in our definitions; and, in any case, this need not hinder our appreciation of the positive merits of the book as interesting popular reading in the history of science. That it may mislead some as to the meaning and uses of philosophy is perhaps a small matter.

The work contains an analytic table of contents, thirty-four chapters, a select bibliography with fifty-one titles, besides numerous other references in the text, and a fifteen-page index. From the following titles of chapters, one may gather the drift and style of the work: "*Imago Mundi*," "The Overcoming of Appearances," "Micro-man: The Bacillus on the Wheel," "The Beginnings of Certitude," "Bion and the Doctrine of the Round Earth," "Eratosthenes and the Earliest Measures of the Earth," "Aristarchus and the Distance and Grandeur of the Sun," "The Turning of the Earth: The Fixity of the Sky," "The Flying Earth: The Fixity of the Sun," "Archimedes and the First Ideas of Gravitation," "Democritus and the Concept of an Atomic Universe," "The Legacy of the Greeks," "The Rebirth of Time," "Copernicus: The True System of the World," "Bruno and the Reception of the New Ideas," "Kepler: Pioneer of the Modern Ideas of Natural Law," "Galileo and the Optic Tube," "The Advance Toward a Rational World Conception," "The True Grandeur of the Sun," "The Development of Mechanics: The Forerunners of Newton," "Newton and the Motor Force of the World Machine," "Halley and the Messengers of the Gods," "Roemer and the Proof of the Earth's Motion," "Laplace and the Stability of the Solar System," "Fixing the Boundaries of our Solar World," "Herschel and the Helter-Skelter Flight of the Stars," "The Measure of Stellar Space," "The Spectroscope and the Stuff of Cosmos," "Our Place in Space: The Plurality of Worlds," "The Astronomy of the Invisible," "The Structure of the Universe," "The Birth and Death of Worlds," "The Cosmic Exchange of Matter and Life," "The Last Riddle," "The End of the Machine."

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